IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Re:	Application of:	Jean-Paul MARDON et al.
	Serial No.:	10/728,237
	Filed:	December 3, 2003
	For:	ALLOY TÚBE FOR NUCLEAR FUEL ASSEMBLY AND METHOD FOR MAKING SAME
	Art Unit:	1793
	Examiner:	John P. Sheehan

Mail Stop: APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

November 10, 2009

APPELLANT'S BRIEF UNDER 37 C.F.R. § 41.37

Sir:

Appellants submit this brief for the consideration of the Board of Patent Appeals and Interferences (the "Board") in support of their appeal of the Final Rejection dated May 18, 2009 in this application. The statutory fee of $540.00 is submitted concurrently herewith. If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

1. REAL PARTY IN INTEREST

The real party in interest is Framatome, a French corporation having a place of business in Courbevoie, France and Compagnie Generale Des Matieres Nucleaires, a corporation having a place of business in Velizy Villacoublay, France, the assignees in the above-identified patent application.

2. RELATED APPEALS AND INTERFERENCES

Appellants, their legal representatives, and assignee are not aware of any appeal or interference that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal. See Appendix C.

3. STATUS OF CLAIMS

Claims 1 to 12 are pending in the application. Claims 1 to 6 are canceled. Claims 7 to 12 were rejected in the Final Office Action dated May 18, 2009.

The rejections to claims 7 to 12 thus are appealed. A copy of appealed claims 7 to 12 is attached hereto as Appendix A.

4. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the May 18, 2009 Final Office Action.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent claim 7 recites a method of manufacturing tubes intended for making all or the external part of a sheathing tube for a nuclear fuel rod or a guide tube for a nuclear fuel assembly, comprising: forming a bar of a zirconium based alloy which also contains (for example, paragraph [0008], lines 1 to 2, of the application as published); 0.03 to 0.25% in total firstly of iron (for example, paragraph [0008], line 3); secondly, at least one of the elements

selected from the group consisting of chromium and vanadium (for example, paragraph [0008], lines 3 to 5); 0.8 to 1.3% of niobium (for example, paragraph [0008], lines 5 to 6); less than 2000 ppm of tin (for example, paragraph [0008], line 6); 500 to 2000 ppm of oxygen (for example, paragraph [0008], lines 6 to 7); less than 100 ppm of carbon (for example, paragraph [0008], line 7); 5 to 35 ppm of sulfur (for example, paragraph [0008], line 8); and less than 50 ppm of silicon (for example, paragraph [0008], line 8); quenching the bar in water after heating to between 1000° and 1200°C (for example, paragraph [0009], lines 1 to 2); extruding a blank after heating to a temperature of between 600°C and 800°C (for example, paragraph [0010], lines 1 to 2); cold-rolling said blank in at least four passes to obtain a tube, with intermediate heat treatments between 560°C and 620°C (for example, paragraph [0011], lines 1 to 3); and applying a final heat treatment between 560°C and 620°C (for example, paragraph [0012], lines 1 to 2), all the heat treatments being applied in an inert atmosphere or under vacuum (for example, paragraph [0012], lines 2 to 3).

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 7 to 11 **[sic 12]** were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,649,023 to Sabol et al. (hereinafter "Sabol") in view of U.S. Patent No. 5,832,050 to Rebeyrolle et al. (hereinafter "Rebeyrolle") and U.S. Patent No. 5,478,419 to Dumas et al. (hereinafter "Dumas").

7. ARGUMENTS

A. 35 U.S.C. §103(a) Rejections

Claims 7 to 12 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sabol in view of Rebeyrolle and Dumas.

Sabol discloses a process for fabricating a zirconium-niobium alloy. "The alloys are beta-quenched and subsequently treated at lower temperatures than normal annealing temperatures and fabricating steps. In formation of tubing, for example, the beta-quenched alloy is extruded at a temperature at or below 650°C and between subsequent cold working steps, the article is

subjected to cold working anneals at a temperature at or below 650°C. The resultant article is given a final anneal at a temperature also below 650°C, and preferably around 500°C." (Column 2, lines 6 to 8).

Rebeyrolle discloses "zirconium-based alloy for the manufacture of elements used in a nuclear reactor and to the elements produced from this alloy." (Column 1, lines 6 to 8).

Dumas discloses a process for the manufacturing of a flat product of zirconium alloy comprising heating in the β range with infra-red lamps.

Claim 7 recites "[a] method of manufacturing tubes intended for making all or the external part of a sheathing tube for a nuclear fuel rod or a guide tube for a nuclear fuel assembly, comprising:

forming a bar of a zirconium based alloy which also contains;

0.03 to 0.25% in total firstly of iron;

secondly, at least one of the elements selected from the group consisting of chromium and vanadium;

0.8 to 1.3% of niobium;

less than 2000 ppm of tin;

500 to 2000 ppm of oxygen;

less than 100 ppm of carbon;

5 to 35 ppm of sulfur; and

less than 50 ppm of silicon;

quenching the bar in water after heating to between 1000° and 1200°C;

extruding a blank after heating to a temperature of between 600°C and 800°C;

cold-rolling said blank in at least four passes to obtain a tube, with intermediate heat treatments between 560°C and 620°C; and

applying a final heat treatment between 560°C and 620°C, all the heat treatments being applied in an inert atmosphere or under vacuum."

Neither Sabol nor Rebeyrolle teach or show the claim requirement "all the heat treatments being applied in an inert atmosphere or under vacuum," that is recited in claim 7. Dumas fails to teach all of the steps claimed in the method of manufacturing, such as "forming a bar of a zirconium based alloy," "quenching the bar in water after heating to between 1000° and

1200°C;" "extruding a blank after heating to a temperature of between 600°C and 800°C;" "cold-rolling said blank in at least four passes to obtain a tube, with intermediate heat treatments between 560°C and 620°C;" and "applying a final heat treatment between 560°C and 620°C," as required in claim 7. Dumas also fails to teach the composition of "the tube forming a bar of a zirconium based alloy which also contains; 0.03 to 0.25% in total firstly of iron; secondly, at least one of the elements selected from the group consisting of chromium and vanadium; 0.8 to 1.3% of niobium; less than 2000 ppm of tin; 500 to 2000 ppm of oxygen; less than 100 ppm of carbon; 5 to 35 ppm of sulfur; and less than 50 ppm of silicon," as recited in claim 7. The Office Action cites to Dumas, column 1, lines 45 to 50, for teaching the use of an inert gas. However, Dumas states "this heating [using infrared lamps] is most frequently carried out in an atmosphere of inert gas." There was no reason or motivation for one of skill in the art to modify the teachings of heat treatments of Sabol and Rebeyrolle with those of infra red heating of Dumas. Above all, Dumas teaches a method for the manufacture of a **flat** product which is inapplicable to the manufacture of the "form[ed] bar of zirconium" which eventually "passes to obtain a tube" as presently claimed. Tubes used in nuclear reactors require completely different manufacturing processes due to their compositions and desired final shapes and characteristics. Flat products and tubes have completely different behaviors regarding their respective deformation processes and the texture which results from these processes. Therefore, there is no reason or motivation that one of skill in the art would modify Sabol in view of Rebeyrolle and the flat products and infra red teachings of Dumas. Dumas teaches different compositions undergoing different manufacturing processes.

Reversal of the rejections to claims 7 to 12 is respectfully requested.

Claims 9 and 10 Argued Separately

Furthermore, with regards to claims 9 and 10, Sabol uses one of Fe, Cr, Mo, V, Cu, Ni and W, these cannot be considered as completely equivalent to Fe as for their effects on the properties of alloys. In particular, Fe, Cr and V do not have the same metallurgical effects and therefore, modifying Sabol to obtain the present invention would not have been obvious. The valued properties of Sabol could have been largely downgraded if the composition of Sabol was

modified, without necessarily obtained new properties such as those disclosed in the specification.

Cr is not equivalent to Fe in that it causes significant changes in the intermetallic phase $Zr(Nb, Fe, Cr)_2$ which can lead to some lowering of the corrosion resistance if the Cr content is too high (over 250 ppm). For a Fe/Cr ratio about 30, corrosion at 400°C in water is not much affected by Cr. But generally speaking corrosion resistance at 400°C is better if the ratio Fe/(Cr+V) is high. (See Specification page 4, line 27 to page 5, line 8). So it cannot be said that Cr and Fe would be replaceable by each other. It is respectfully submitted that if Cr and Fe were replaceable by one another (which the applicant does not agree with) there would be no need to optimize the Fe/Cr ratio as in claims 9 and 10, only the sum Fe+Cr should have been considered.

Also, V has a marked effect on the hydrogen absorption by the alloy. Replacing some of the Fe by V, up to 25% of, causes a delay in the recrystallization and a slight reduction of the grain size. The density of the intermetallic compounds is diminished and their composition is modified. A consequence is that an increase in V is somewhat detrimental to all kinds of corrosion. But in some instances, in particular at the highest temperatures, hydrogen absorption is diminished by the presence of V, so that one of the main drawbacks of Zr-1%Nb alloys can be attenuated.

Concerning Ni and Cu, they do not form the same precipitates as Cr and Fe. They form $Zr_2(Fe,Ni)$ or $Zr_2(Fe,Cu)$. Mo has a behavior comparable to Cr.

In view of this, it is furthermore respectfully submitted that one of skill in the art would not have modified Sabol in view of Rebeyrolle and Dumas, because the concentrations in Sabol are specifically to that alloy and altering such alloy can alter the properties derived by Sabol.

Reversal of the rejections to claims 9 is 10 is respectfully requested.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance. Favorable consideration of this appeal brief is respectfully requested.

Respectfully submitted,

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DATED: November 10, 2009

By: _____

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APPENDIX A:

PENDING CLAIMS 7 to 12 OF U.S.
APPLICATION SERIAL NO. 10/728,237

Claim 7 (previously presented): A method of manufacturing tubes intended for making all or the external part of a sheathing tube for a nuclear fuel rod or a guide tube for a nuclear fuel assembly, comprising:

forming a bar of a zirconium based alloy which also contains;

0.03 to 0.25% in total firstly of iron;

secondly, at least one of the elements selected from the group consisting of chromium and vanadium;

0.8 to 1.3% of niobium;

less than 2000 ppm of tin;

500 to 2000 ppm of oxygen;

less than 100 ppm of carbon;

5 to 35 ppm of sulfur; and

less than 50 ppm of silicon;

quenching the bar in water after heating to between 1000° and 1200°C;

extruding a blank after heating to a temperature of between 600°C and 800°C;

cold-rolling said blank in at least four passes to obtain a tube, with intermediate heat treatments between 560°C and 620°C; and

applying a final heat treatment between 560°C and 620°C, all the heat treatments being applied in an inert atmosphere or under vacuum.

Claim 8 (previously presented): The method as recited in claim 7 wherein the alloy contains at most 0.20% of iron.

Claim 9 (previously presented): The method as recited in claim 7 wherein the Fe/(Cr+V) ratio is between 0.5 and 30 by weight.

Claim 10 (previously presented): The method as recited in claim 7 wherein the Fe/(Cr+V) ratio is at least 0.5 and the content of Fe+Cr+V is at least 0.03%.

Claim 11 (previously presented): The method as recited in claim 7 wherein the oxygen content is between 1000 and 1600 ppm.

Claim 12 (previously presented): The method as recited in claim 7 wherein the final heat treatment brings the tube to a recrystallized state.

APPENDIX B

Evidence Appendix under 37 C.F.R. §41.37(c)(ix):

No evidence pursuant to 37 C.F.R. §§1.130, 1.131 or 1.132 and relied upon in the appeal has been submitted by appellants or entered by the examiner.

APPENDIX C

Related proceedings appendix under 37 C.F.R. §41.37(c)(x):

As stated in "2. RELATED APPEALS AND INTERFERENCES" of this appeal brief, appellants, their legal representatives, and assignee are not aware of any appeal or interference that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal.